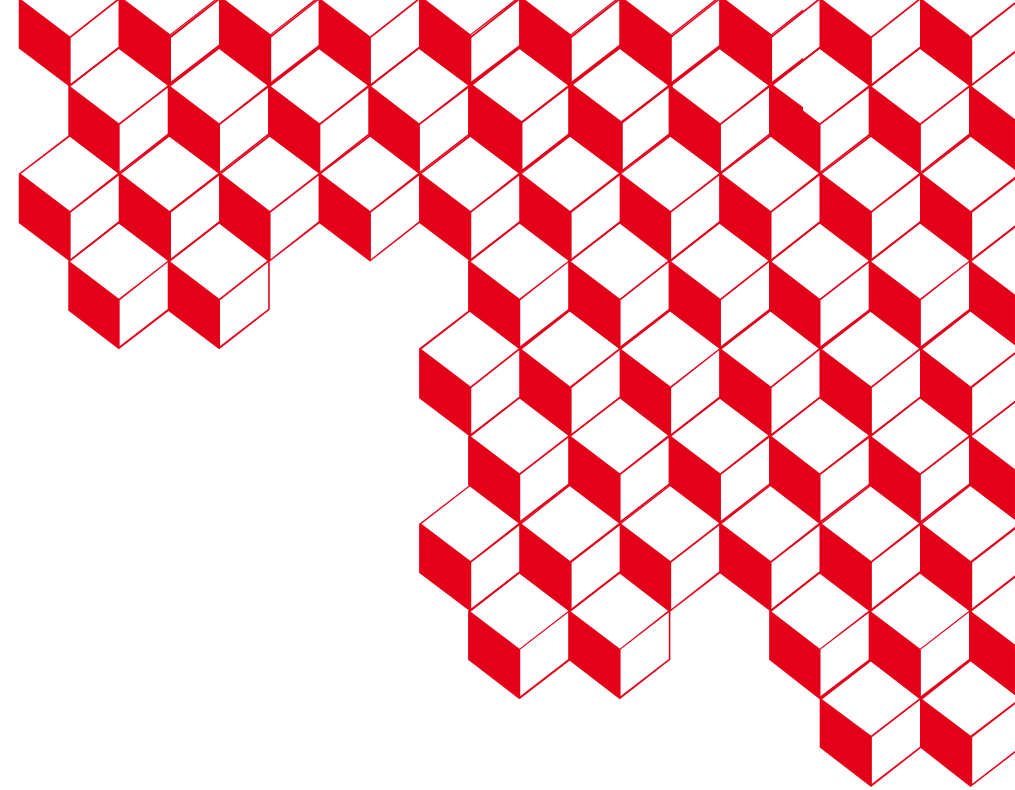




iresne



Research Institute for Nuclear Systems for Low-Carbon Energy Production

Jean-Michel RUGGIERI – Wonder 2026

IRESNE Institute

Fission R&D within the CEA Energy Division

To study of nuclear systems for low carbon energy production integrated into an energy system

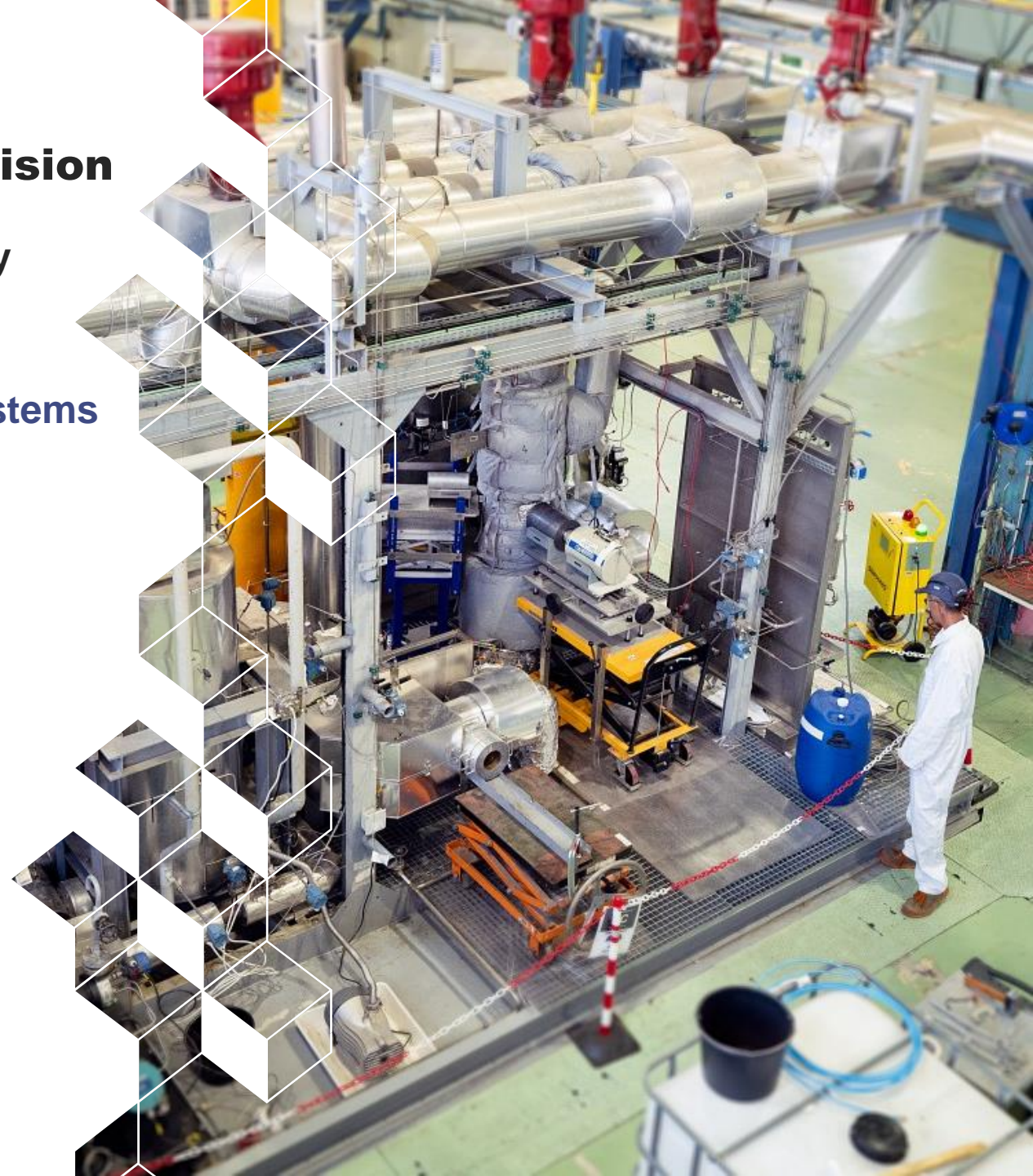
Based on Expertise and innovation for nuclear systems

- Fuels
- Reactors
- Systems and Technologies

With Cross Cutting R&D activities

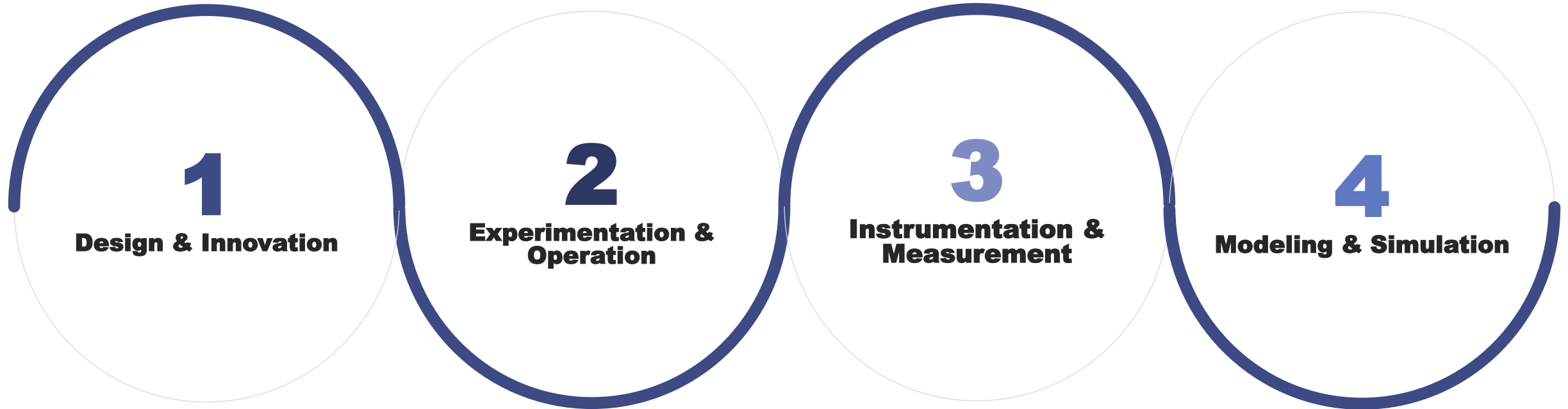
- Innovation in nuclear systems
- Experimentation and operation
- Instrumentation and measurement
- Modeling and Simulation

A Unique Experimental Platform for Fission R&D



IRESNE

Cross Cutting R&D Activities



**Based on a Unique Experimental platform for energy systems
34 Research & Development laboratories**



Design & Innovation

6 laboratories dedicated to the design of components and systems, up to the pre-design of innovative reactors

- Development of innovative fuels, components and instrumentation
- Energy conversion systems and alternative energy vectors
- 4th generation reactors - fuel cycle closure (building on the ASTRID feedback)
- Innovative modular reactors: Small Modular Reactors (water-cooled) - Advanced Modular Reactors (sodium, molten salt reactors MSR)
- Development of a dedicated heat SMR concept : ARCHEOS

With the support of all engineering sciences: Neutronics, solid and fluid mechanics, thermohydraulics, material sciences, magnetohydrodynamics, robotics, system dynamics, process engineering, ... and the use of technical-economic approaches.



Experimentation & Operation

11 laboratories dedicated to experimentation and operation

A unique set of experimental facilities

- Nuclear research reactors: CABRI, future RJH
- Experimental facilities and test loops: POSEIDON, PLINIUS, PAPIRUS, ...
- Facilities dedicated to nuclear fuel: LECA-STAR, UO₂ Laboratory

A strong collaboration network

- CEA institutes: ISAS, ISEC, ...
- International collaborations: JSI, MIT, SCK-CEN, PSI, CNESTEN, etc.

Experimentation is essential for the validation of simulation codes.



Instrumentation & Measurement

8 laboratories dedicated to instrumentation and measurement

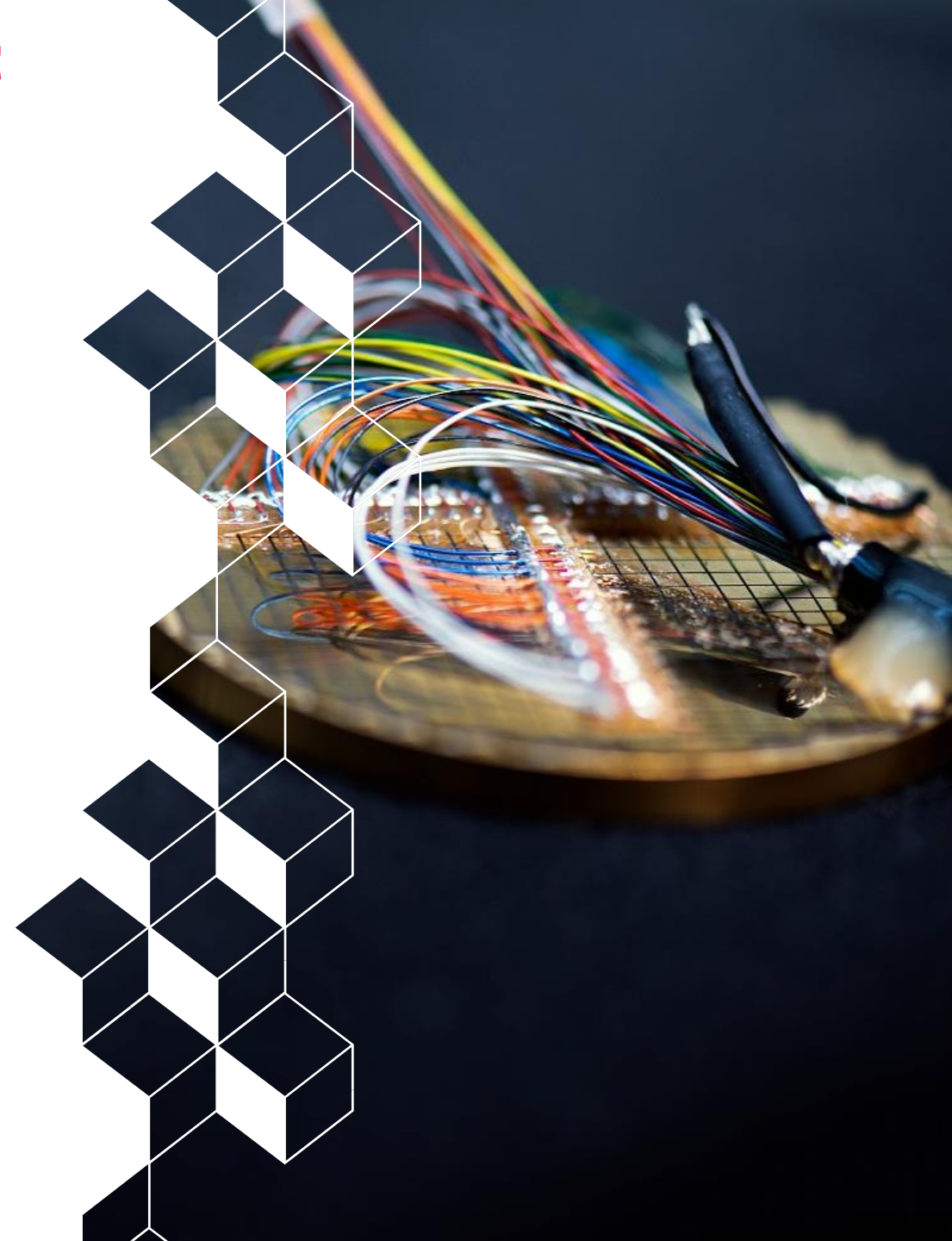
- Nuclear measurements and measurements in extreme environments
- In-reactor dosimetry – MADERE (COFRAC-accredited)
- Custom manufacturing workshop for fission chambers

A strong collaboration network

- CEA institutes: LIST, LITEN, IRFU
- LIMMEX and MISTRAL: joint laboratories with Aix-Marseille University
- On-site nuclear measurements at EDF NPPs (EMECC, ...)

Instrumentation is essential for experimentation

Three start-ups created since 2024: FLUIIDD, IMPROV'HEAT, PIVUS

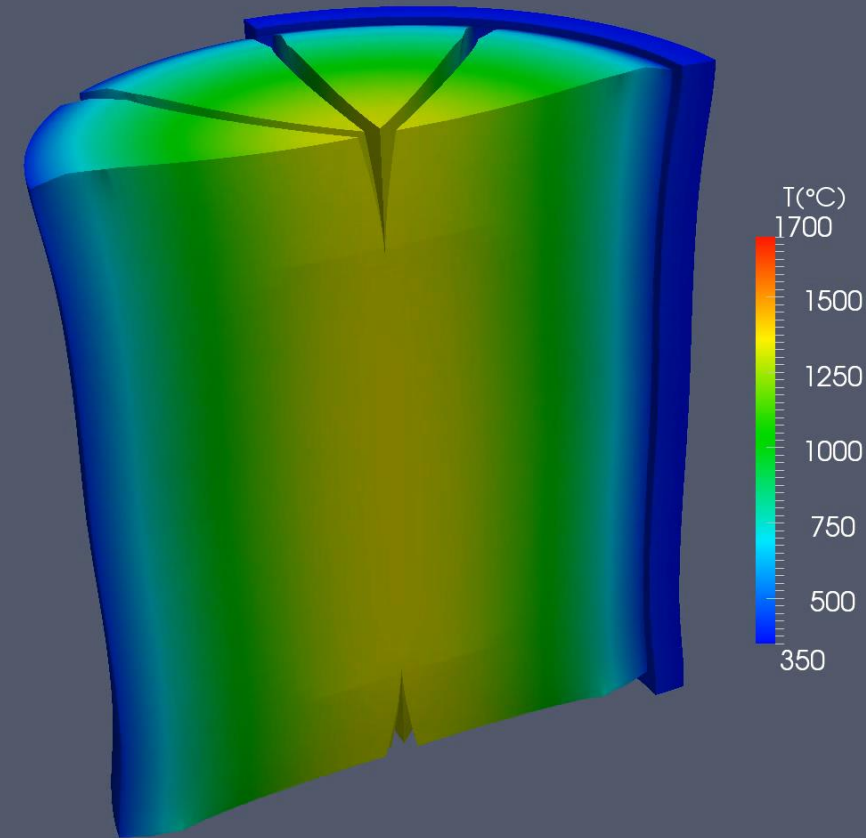


Modeling & Simulation

9 laboratories dedicated to the development, validation and use of scientific codes, and to data capitalization.

- **Reactor physics - neutronics** (APOLLO, TRIPOLI ...)
- **Fuel behaviour in nominal, incidental and accidental situations** (PLEIADES ...)
- **Solid and fluid mechanics** (CASTEM, TRIO-CFD, NEPTUNE ... & "commercial software")
- **Reactor operation in nominal, incidental and accidental situations** (CATHARE, SIMMER, PROCOR,...)
- **Calculation of nuclear energy scenarios** (COSI)
- **Evaluated nuclear data** (JEFF 4.0): a global reference.

Transitoire



Temps (jour 485) : 57 s

Deplacements x 30

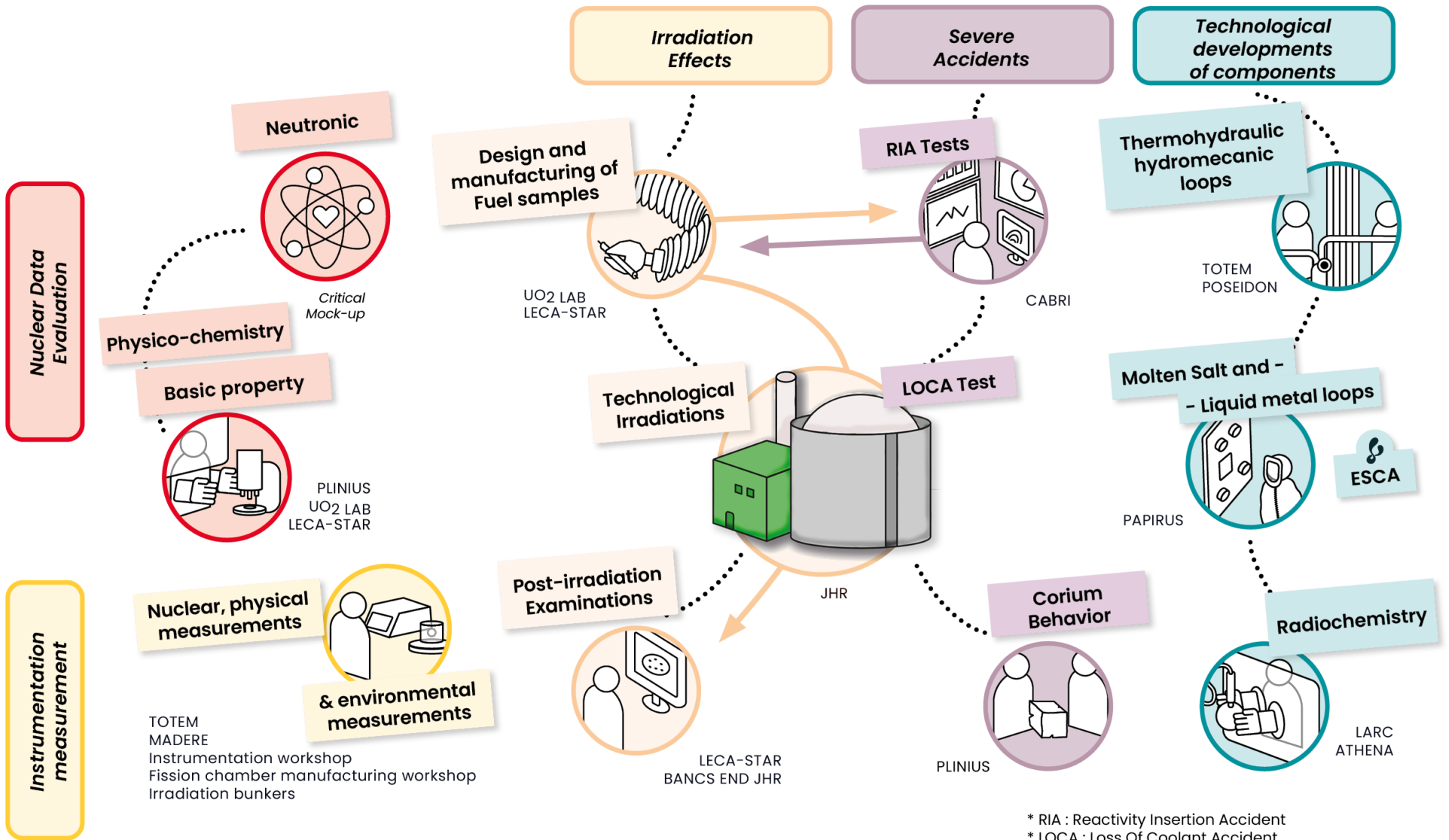
SNA_Presentation © Marine nationale / Défense



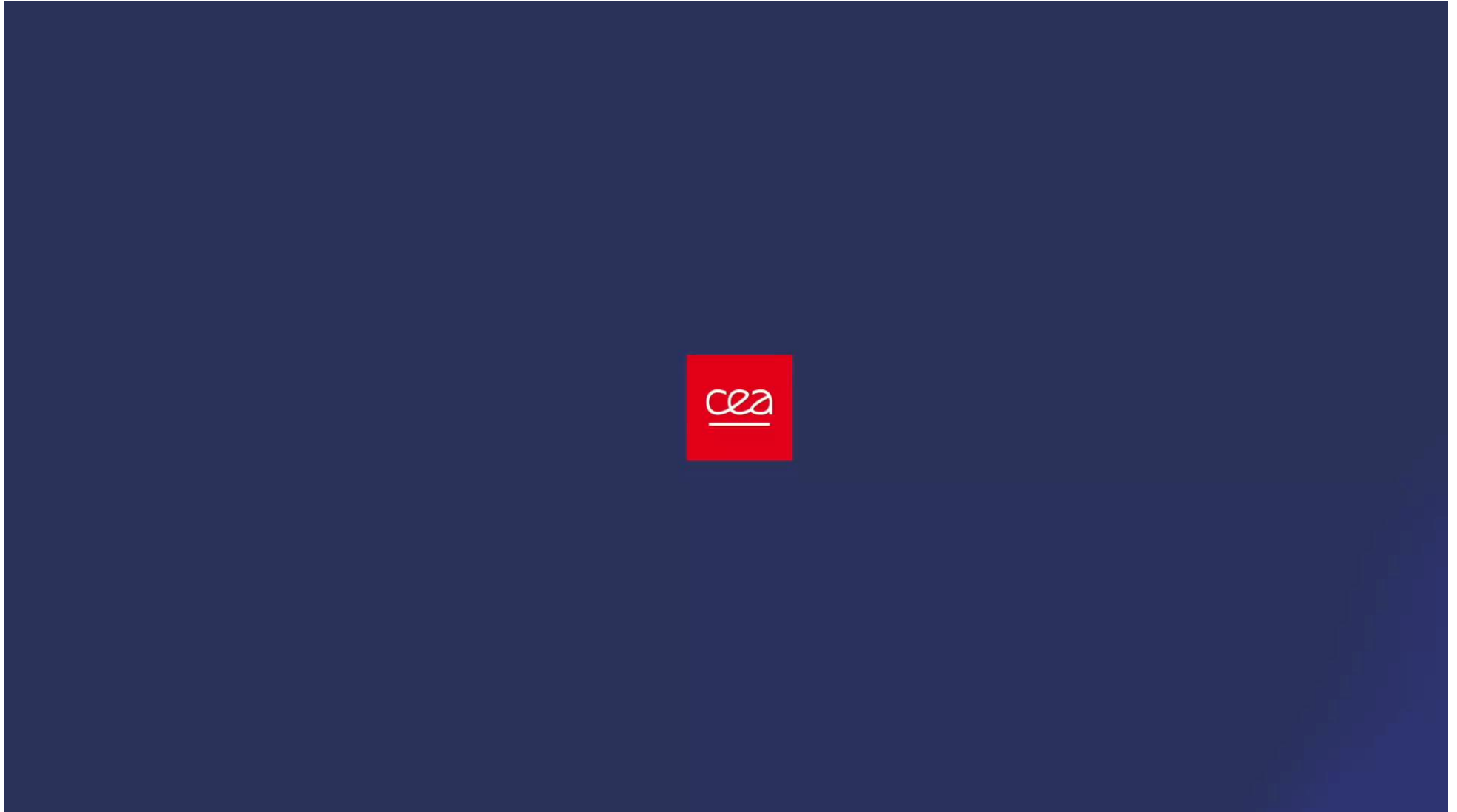
These means are gathered in a unique R&D Fission Platform

MAIN EXPERIMENTAL FEATURES

CROSS CUTTING MEANS



Unique Experimental « fission » Platform



IRESNE

Resources and collaborations

1000 employees
(permanent & fixed-term)

600

engineers – researchers

180

operating and
experimental technicians

120

PhD students and
postdocs

100

block release apprentices



IRESNE

Partnerships

Various partnerships, collaborations and projects.

Industrial

- Partnerships and services with the major French nuclear industries: EDF, FRAMATOME, ORANO, IRSN, ANDRA (with multi-year framework contracts)
- Collaboration agreements and services with other companies and R&D organisations (including SMEs) in France and abroad (Westinghouse, MHI, KEPCO, JAEA, NPIC, etc.)
- A R&D toward real industrial issues and challenges of the nuclear sector

Academic

- Aix Marseille University: joint laboratories LIMMEX and MISTRAL and joint institute ISFIN
- Schools and Universities of Toulouse, Montpellier, Lyon, Bordeaux, Grenoble, Strasbourg, Nancy,...

Institutional

- Multilateral framework: OECD/NEA, IAEA
- European projects : H2020 and Horizon Europe
- National offices: ANR, PIA, Economic Recovery Plan and regional initiatives.

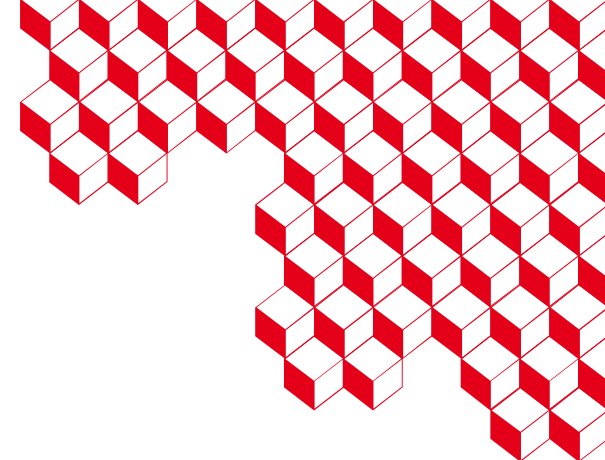


IRESNE in action (video clip)





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Thank you

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[Website CEA IRESNE](#)

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Photos credit : A.Aubert/CEA

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